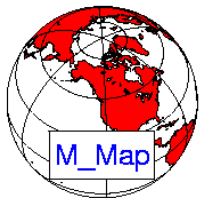


Getting started with M_Map for Matlab

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Description

- M_Map is a MATLAB package developed by Rich Pawlowicz (yes, the same guy that developed T_Tide!).
- It allows you to plot good maps, with a very large choice of projections, to make sure that your map is adapted to your region of study (Scotian Shelf vs. Pacific Ocean vs. Arctic Ocean vs. ...).

“You have collected your data, loaded it into Matlab, analyzed everything to death, and now you want to make a simple map showing how it relates to the world.”

Getting started

1. Start by getting the package online, either on Rich's website, either via SEA-MAT's website. While you are there, also **download the User Guide**. The answers to almost every questions are in there!
2. Decompress the package, add it to your MATLAB folder and add the folder (and subfolders!) to your MATLAB's search path
3. Go to MATLAB and type 'm_demo' in the command window. If it works, you successfully installed the m_map package (You may get a few warnings, due to obsolete pieces of code or missing topography)

Make a map (1/2)

- The first thing to do is to choose your projection. Rich's website shows examples of the different available projections, and the user's guide gives you a description for each of them.
- There are two important characteristics you must pay attention to. Is the projection
 1. Conformal? That is, it preserves angles for differentially small regions.
 2. Equal-area? i.e. area is preserved throughout the domainThey can be equal-area, conformal, or neither. They cannot be both. If you are planning on calculating areas based on your map, make sure you have chosen an equal-area projection!

Make a map (2/2)

- 3 code lines are required to produce a map:

1. One that calls the projection

```
m_proj('lambert', 'long', [-160 -40], 'lat', [30 80]);
```

2. One that defines the boundaries (coastlines)

```
m_coast('patch', [.5 .5 .5]);
```

3. One that draws the box

```
m_grid('box', 'fancy', 'tickdir', 'in');
```

Type `help functionname` for help with the arguments, or refer to the User's Guide

NOTE: M_Map functions start with 'm_'. It means that regular functions such as plot, pcolor, scatter, etc... will NOT work.

Coastlines

- This is good, but what happens if I plot a smaller region?
Try:

```
m_proj('lambert','long',[-70 -60],'lat',[40 50]);  
m_coast('patch',[.5 .5 .5]);  
m_grid('box','fancy','tickdir','in');
```

- This is not so good anymore... Fortunately, you can install a higher resolution coastline into the `m_map` package. Take a few moments to read Section 11 of the User's Guide. It will explain, step-by-step, how to download and install high-resolution coastlines.

Coastlines

- Instead of calling `m_coast`, we now call the function `m_gshhs_rez`

```
m_proj('lambert','long',[-70 -60],'lat',[40 50]);  
m_gshhs_l('patch',[.5 .5 .5]);  
m_grid('box','fancy','tickdir','in');
```

- You can use `m_gshhs_l()`, `m_gshhs_i()` or `m_gshhs_h()` for different resolution. CAUTION: Plotting a large domain with high resolution will take a long time, so choose wisely!

MATLAB functions in M_Map

- Section 12 of the User's Guide lists the functions included into the M_Map package.
- It includes modified plotting functions (`m_plot`, `m_pcolor`, `m_contour`, ...) that automatically converts (lon,lat) into projected (lon,lat)
- If you want to use a MATLAB function that do not have its 'm_' equivalent, then you need to first convert (lon,lat) coordinates into map coordinates, using the function `m_ll2xy()`


```
% Map
m_proj('albers equal-area conic',...
       'long',[-64 -62.4],'lat',[43.4 45]);
m_gshhs_h('patch',[.5 .5 .5]);
m_grid('box','fancy','tickdir','in','fontsize',16,...
       'fontname','cambria','linestyle','none');
hold on

%transform coord (lon/lat) to map coord (x/y)
[X,Y]=m_ll2xy(-63.30518,44.35206);

% plot the location
scatter(X,Y,75,'v','filled',...
       'Markeredgecolor','k','Markerfacecolor','k')
% display station name
m_text(-63.325,44.38,'T1','fontname','cambria',...
       'fontsize',15,'fontweight','b')
```